

How to Make the Most of the Hours We Have Left

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"The only source of knowledge is experience." –Albert Einstein

"Experience is the teacher of all things." –Julius Caesar

INTRODUCTION

Experience matters. As Albert Einstein, Julius Caesar, and many other philosophers and wise men have said, experience is the one proven way to gain knowledge. Because experience matters so much, our profession must make every effort to make sure that each of us attains the experience necessary to best serve our patients. But these efforts are made more difficult because our hours in surgery have dropped: our residents' hours have been limited to 80 per week since 2003, and as the fees for services paid to our licensed physicians have decreased, their hours worked have fallen to just 49 per week in metropolitan areas and 52 hours per week elsewhere, as Staiger et al^{1,2} have shown. This reduction in hours poses a direct challenge to our profession's duty to ensure that every doctor has the proper amount of experience. In this article, I will address that challenge.

Our duty—to ensure that each one of us has the experience necessary—is all the more important because we in the profession are the only ones who can verify that every surgeon we train has the experience necessary to best serve patients and attain the best possible outcomes. The outside world—as demonstrated by many of the patients who walk into our offices—measures our experience by the diplomas on our walls, as McKnight and Sechrest have pointed out.³ Many of these patients come to us primarily because of the credentials we hold.^{3,4} But as those of us who have attained these degrees know all too well, credentials do not necessarily represent a surgeon's expertise, experience, or knowledge; instead, credentials show only that this person has been trained in the field in which they proclaim expertise. We are all familiar with the fa-

mous surgery professor who has written innumerable papers and has received worldwide accolades but is not technically skilled and has more complications than other surgeons. Simply put, credentials alone do not equate to real-world expertise.

This article addresses the challenge posed by the recent reduction in the hours worked by residents, junior attendings, and licensed physicians alike. In Part I, I will show that the numbers of hours worked is a very good proxy for a worker's experience, both in the medical field and in other professions. In Part II, I will point to evidence that fewer hours worked means more errors on the job. But there is hope yet—Part III describes breakthroughs in psychology and business methods that should, if we can learn from them and incorporate them into our training approaches, permit our residents and junior attendings to attain the necessary level of experience despite the fewer hours they may work. We can all agree that the ultimate goal of our health-care system should be to improve patient care, quality, safety, and outcomes.⁵⁻⁷

I. A MATTER OF TIME

Time on the job is the most common measure of experience.^{3,4} After she glances at our diplomas, our average patient's first question is how many years her doctor has practiced. And her question is a wise one. The American Association of Retired Persons (AARP) recently warned its members to avoid hospital care in July when possible, because of the lower level of care provided by inexperienced residents during that month.⁸ Recent studies from Europe validate that decreasing resident hours to a 50-hour week has a negative effect on surgical training and on quality of patient care, and "although resident's quality of life improved slightly, the work hour limitation for surgical residencies as instituted in Switzerland appears to be a failure."⁹ Indeed, time on the job can even compensate for the effects of aging. As Jon C. White, MD, writes, in practice, he himself "feels like an aging baseball pitcher who relies more on his experience and knowledge to outsmart batters rather than his power to overwhelm with fast balls."¹⁰ It is no surprise that our educators worry about the reduction in residents' hours: Fewer hours mean less experience.¹¹⁻¹⁴

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My own experience learning laparoscopy bears out the truth that hours on the job matter. In 1990, after I had been in practice for 11 years, I was introduced to laparoscopy. I was very fortunate to be the beneficiary of hidden advantages and extraordinary opportunities (a phenomenon described by Malcolm Gladwell in his book *Outliers*¹⁵) that allowed me to develop my laparoscopic skills, while other pediatric surgeons at the time were unable to be part of this experience.

I always believed that an expert doing a surgical procedure for the first time should be considered inexperienced. I took the laparoscopy courses available at that time and befriended the adult surgeons and gynecologists doing laparoscopy. After a period of proctoring, I started to do laparoscopic procedures alone. There is no question that my previous experience with open surgery facilitated my laparoscopic education. When I started learning laparoscopy, I already had a base of knowledge and a set of skills. I am an example of the effect demonstrated by Grantcharov et al,¹⁶ who described how surgeons with different laparoscopic backgrounds had different learning curves for learning laparoscopy. In their study, “the familiarization rate on the simulator was proportional to the operative experience of the surgeons. Experienced surgeons demonstrated best laparoscopic performance on the simulator, followed by those with intermediate experience and the beginners.”¹⁶ This study demonstrates that previous exposure provides an advantage when one is acquiring a new set of skills. In other words, a surgeon and a surgical resident are likely to extract different amounts of new knowledge from observing a new surgical procedure.

We should note that the number of hours on the job matters not just in medicine, but in other fields as well. In his book *Outliers*, Malcolm Gladwell proposes that a person must spend approximately 10,000 hours of practicing a specific task before he or she can achieve true expertise or greatness in that task.¹⁵ Gladwell cites many examples of this “10,000 Hour Rule” from various fields and professions.¹⁵ Certain professions’ hours standards support the

idea that a minimum number of hours of practice is required to attain expertise. For example, clinical psychologists must spend 400 clinical hours and one full year in the field to successfully complete a PhD in clinical psychology.³ A sport pilot requires 20 hours of flight time, a private pilot 40 hours, and a commercial pilot 250 hours to qualify for a license.¹⁷

Piloting is a particularly good analogy to the practice of medicine; it is therefore no surprise that pilots, like doctors, count their experience by the number of hours on the job. To explore the concept of the role pilot experience can play in aviation outcomes, I compared the outcomes of 3 aviation crashes and evaluated some of the differences between them (**Table 1**).¹⁸

Obviously there are many factors that can affect the outcome of a plane crash. However, it is very likely that the pilot’s experience in the third example above, the US Airway Flight 1549 crash, was crucial to the difference between a successful outcome and tragic one. In that case, the pilot, Captain Chesley B. Sullenberger (also known as Sully), successfully landed US Airway flight 1549 on the Hudson River. As the comparison above shows, Sully and his first officer had more flying experience than the 2 captains and 2 first officers of the fatal crashes combined, and Sully had served as a pilot for the US Air Force. Sully’s experience and professionalism have been cited as central reasons for the successful outcome of the US Airway Flight 1549 crash.¹⁹ It is interesting to consider whether the outcomes of the other 2 crashes would have been different had the pilots had more experience.

To be sure, the correlation between experience, knowledge, and competence is complex, and the method of measuring experience by counting hours worked may be imprecise.^{3,4,20–22} Is the surgeon who has performed an operation 500 times always more competent than the one who has performed the same operation only 250 times? Is the hospital with a higher volume of gastric bypasses more competent than one with lower volume? Not necessarily. As Livingston and Cao²³ have argued, some of the

Table 1.				
	Survivors	Hours of Flight Captain/First Officer	Pilot Error	Communication
Comair Flight 191 Aug 26, 2006	1	4710/6546	Yes	Poor
Colgan Air 3407, Feb 12, 2009	0	3379/2220	Yes	Poor
US Airway 1549, Jan 15, 2009	155 (all)	19,663/15,643	No	Excellent

initial studies supporting a volume-outcome relationship are methodologically flawed, and volume should only be entered into regression analysis as a continuous variable. In addition, risk adjustment variables must consider adverse outcomes associated with a procedure, and are quantitatively important in explaining some proportion of explained variance in the resultant statistical model.²³

In other fields, experience may be rewarded (perhaps incorrectly) even when the experience is gained through failure. For example, executives who perform poorly in organizations and bankrupt them may later be rewarded by a similar or higher level position in another organization, on the basis that they have learned from the previous bad experience and will not repeat the same mistakes. As Mark Twain warns us, "We should be able to get out of an experience only the wisdom that is in it, and stop there; lest we be like the cat that sits down on a hot stove-lid. She will never sit down on a hot stove-lid again, and that is well; but she will never sit down on a cold one anymore." Nevertheless, hours worked remains a fair proxy for level of experience. Thus, the fact that surgical trainee hours have dwindled to fewer than before poses a serious challenge that we must address.

II. THE CHALLENGE OF DWINDLING HOURS

Dr. Richard Reznick, a Canadian surgical educator and my coresident during our surgical training in Toronto, reminisces about the 100+ hour weeks we used to work in those days.⁵ During most of our internship and residency, we resided in the hospital. We felt that a missed case was a lost opportunity to learn. Dr. Reznick feels that those days are obsolete, and I believe he is right.⁵

Hours are dwindling overseas as well. As Dr. Reznick points out, European training programs currently mandate that trainees spend no more than 48 hours per week working, and Canada restricts hours to just 72 per week.⁵ Training in Scandinavia is currently restricted to 40 hours per week.²⁴ Recently Dr. Maria Allo reported in her presidential address to the Southwestern Surgical Congress that in Sweden, general surgeons have the highest rate of suicide among all physicians.²⁵ While the cause of this is a mystery, at first glance, it seems strange that fewer hours may not lead to greater life satisfaction as most people might think. Without making any assumptions, this is an interesting statistic that possibly raises many questions.

Dr. Reznick discusses the idea that the pendulum has swung too far, and the concern that following our European counterparts may not be the answer and may produce surgeons and physicians with inferior training and

deficient skills.⁵ Dr. Reznick agrees that new approaches to training must be considered, as "the imperative of patient safety, the reality of the cost of the surgical minute, [and] the need to abandon the 100+ hours of the past are all in conflict with the mission of producing highly capable surgeons."⁵

I do not mean, here, to join the heated and lengthy debate over the effect that the 80-hour-week restriction has had on the patients whom residents care for. The critique that overwork may lead to errors due to fatigue is long-standing: William Stewart Halsted, one of the fathers of our surgical training system, lamented, "the interns suffer not only from inexperience, but also from over experience." But I must point out that the evidence of such "suffering"—on the part of either the residents or their patients—is far from conclusive. Strong points have been made to the contrary. There is evidence that both preventable and nonpreventable errors actually increased after the 80-hour-work-week limitation was implemented.^{26–28} This increase may be attributable to the lack of continuity of care the limitation enforces; if one resident is mandated to go home at a certain time, then the incoming resident may not be sufficiently informed to provide adequate continuity of care to the patient. It is also important to note that most surgery residents do not advocate any further work hour restriction. They realize that good cases often come at unpredictable times.^{26,29} In an editorial in the *American Journal of Surgery*, Dr. L.D. Britt, President-Elect of the American College of Surgeons, suggests that the duty-hour limitation may be flawed; he pointed out that no substantive analysis has been done to objectively evaluate the impact of the 80-hour-week mandate.²⁴

I do not mean to join the debate over whether the 80-hour-per-week restriction should be lifted. It is enough for the present to accept that the restriction is here; and that practicing physicians, too, have seen a reduction in their working hours, as Staiger et al have shown.^{1,2} Bearing this in mind, what I hope to do is suggest how to make the most of the hours we have left.

III. HOW TO MAXIMIZE THE HOURS WE HAVE LEFT

The good news is that some hours on the job matter more than others. As John Dewey, the pre-eminent educational theorist of the twentieth century, said: "The belief that a genuine education comes about through experience does not mean that all experiences are genuinely or equally educative. Experience and education cannot be directly equated to each other."³⁰ Psychologist George Kelly's the-

ory of personal construct suggests that if an event is imperceptible, mere exposure to it does not increase one's experience.³¹ Experience is an active process; observing a case does not necessarily contribute to experience. You may observe several cases but not gain real experience unless you perform the operation yourself. Simply put, some hours of education matter more than others. We must strive to increase these higher-value hours to get the most out of the hours we have left. I suggest we consider 5 approaches.

First, we should realize that surgeons have different cognitive abilities and psychomotor skills, and that these differences matter. Those with higher abilities and skills should spend fewer of their 80 hours in the operating room; those with lower abilities and skills should spend more. I have witnessed this difference in abilities and skills and its effects in our own field of laparoscopic surgery. Some surgeons may become proficient after only a few supervised or proctored procedures, while others may require dozens or even hundreds of procedures before acquiring proficiency. Therefore, there is a need for a new educational system that will recognize the inherent difference in capabilities and cognitive ability of surgical trainees and individualize training accordingly.³² Dr. Reznick proposes a new system in a "modular competency based fashion."³³ He states that the Royal College of Surgeons of Canada has agreed that residents in this new stream will be able to sit for their fellowship examinations when the faculty believes they are competent, which may be either in the traditional 5 years of training, or in more or fewer years for each individual.⁵

Second, we need to be better at giving effective feedback. In his book *Bounce*, Matthew Syed highlights the importance of feedback.³³ It is essential to create a system that provides "perfect conditions for feedback.... If you don't know what you are doing wrong, you can never know what you are doing right."³³ Exposure to a surgical operation in itself—and even performing the operation—is not enough to produce a meaningful experience, as McKnight and Sechrest point out.³ The exposure to the operation must be reconstructed or reinterpreted so that the physician may understand what was done, and why, and then apply that learning to select the best option when faced with clinical situations that may be different than the one just experienced.³¹

It is essential that experienced surgeons provide meaningful feedback to less experienced surgeons in a non-threatening, nonconfrontational manner. This is easier to do with residents than with newly licensed surgeons.

Once we attain our degrees, we too often become defensive to criticism. We need to be more open to feedback throughout our careers, and to heed the wisdom of Leo Tolstoy, who wrote: "The most difficult subjects can be explained to the most slow-witted man if he has not formed any idea of them already: but the simplest thing cannot be made clear to the most intelligent man if he is firmly persuaded that he knows already, without a shadow of doubt, what is laid before him." As John C. Tarpley, MD, pointed out in his presidential address to the Association of VA Surgeons, "If I go to the driving range and hit 3 buckets of balls per week without critical feedback and correction, I will be only grooving my slice."³⁴

In giving feedback, we can learn from the debriefing practiced by the military and the aviation industry.^{35–37} This process is facilitated by the use of video technology in which experts, proctors, and teachers will dissect the operation and identify errors of judgment or technique.

We must also reconsider how our own residents can give feedback to each other, and by so doing strengthen their own grasp of the procedure to be learned. As William Stewart Halsted taught us: "See one, do one and teach one."

Third, we need to make better use of simulators. As practice of skills in the operating room is becoming difficult and expensive, the role of simulators in training has become essential to developing and mastering skills that were otherwise neglected because of patient safety, time constraints, and financial issues.³⁸ The use of simulators in training must be guided by appropriate metrics, expert guidance, and constructing and deconstructing the practice. As Dr. Gerald M. Fried has stated, training using simulators "is more beneficial when incorporated into a curriculum that teaches the accompanying knowledge essential for safe practice of the skills taught in the simulator."³⁹ The goal of research in this area should be to identify the conditions under which experience leads to desired outcomes.

Surgical simulators are not yet as sophisticated as flight simulators.⁴⁰ Flight simulators can mimic almost any situation. And, of course, the mere repetition of tasks in a simulator is not enough to produce a meaningful experience. This experience must be transferred to clinical situations.^{41–43} But simulator experience with repetitions can and does enhance the necessary technical skills to perform a specific surgical task.

In addition, we should consider using visualizations of surgery to replace actual performance of the surgery itself.

Practice can also be done mentally by creating a mental visual board and practice visualizing the anatomy and the different steps of an operation.

Fourth, we need to motivate our residents. In the business world, Victor Vroom designed the expectancy theory of motivation.⁴⁴ Vroom's basic premise was that people will work harder for rewards, if they believe those rewards can be earned by hard work.⁴⁴ The majority of surgical residents are motivated. The problem is the interference of outside agencies that often overlook the essence of the surgical educational system to implement their agenda. Surgical residents may become discouraged because of the apparent loss of autonomy and independent decision-making, and loss of internal motivation, leading to sub-standard results in surgical training. Also, medical students may feel disenchanting with a specialty that they perceive as inflexible, with demanding working hours at a cost to personal and family quality of life.

Vroom realized that an employee's performance is based on individual factors such as personality, skills, knowledge, experience, and abilities.⁴⁴ These factors all need to be incorporated into a surgical training system. There is public support for reducing resident working hours.^{8,45} However, perhaps the public should be more concerned about the availability and quality of care they may receive from surgeons with less experience and inferior training.

Lastly, we must maintain awareness of these challenges, and always remember to try to optimize each of the hours that we do have. We must modify the old dictum that "practice makes perfect" to read instead, "perfect practice makes perfect." Syed elevates this concept to a higher level, which he calls "purposeful practice."³³ We must strive to incorporate the principles of purposeful practice wherever possible.

CONCLUSION

Everyone knows that experience matters. And when a person's life or health is on the line, then experience matters most. Throughout history, the sheer number of hours worked has been the benchmark of experience. As our profession's hours dwindle—for both residents and practicing physicians—we must take action to ensure that the hours we have left count, more than ever before. This task is imperative: If we fail, then our performance and our patients will suffer. As I look toward an era in which new doctors emerge from residency with just 80-hour work weeks (or 72, in Canada; or 40, in Scandinavia)

behind them, I am reminded of the stern but calm warning given by Captain "Sully" Sullenberger, one of the last truly well-trained and experienced airline pilots, as Flight 1549 settled into its last glide toward the Hudson River: "Brace for impact."¹⁹

References:

1. Staiger DO, Auerback DI, Buerhaus PI. Trends in the work hours of physicians in the United States. *JAMA*. 2010;303:747–753.
2. Hyman NH, Kozol RA, Kirton OC, et al. Attending surgeon work hour restrictions. *Arch Surg*. 2008;143:443–444.
3. McKnight P, Sechrest L. The use and misuse of the term "experience" in contemporary psychology: a reanalysis of the experience-performance relationship. *Philosophical Psychology*. 2003;16:431–460.
4. Quinones MA, Ford K, Teachout MS. The relationship between work experience and job performance: a conceptual and meta-analytic review. *Personnel Psychology*. 1995;48:887–910.
5. Reznick RK. Surgery requests exemption from new PAIRO guidelines...or Malcolm Gladwell versus the European Union. *Surgical Spotlight*. University of Toronto; Summer 2009;3–4. http://www.surgicalspotlight.ca/Article.aspx?ver=Summer_2009&f=ChairColumn.
6. Lee Bass B. Matching training to practice. *Ann Surg*. 2006; 243:436–438.
7. O'Shea JS. Becoming a surgeon in the early 20th century: parallels to the present. *J Surg Ed*. 2008;65:236–241.
8. Kirchheimer S. Why you should avoid the hospital in July. *AARP Bulletin*. June 25, 2010. <http://www.aarp.org/health/doctors-hospitals/info-06-2010>.
9. Businger A, Guller U, Oertli D. Effect of the 50-hour work-week limitation on training of surgical residents in Switzerland. *Arch Surg*. 2010;145(6):558–563.
10. White JC. 10,000 operations: musings of a general surgeon. *Bulletin of the American College of Surgeons*. Aug 2009;7–9.
11. Guralnick S, Rushton J, Bale JF, et al. The response of the APPD, CoPS and AAP to the Institute of Medicine report on resident duty hours. *Pediatrics*. 2010;125:786–790.
12. Fischer JE, Healy GB, Britt LD. Surgery is different: a response to the IOM report. *Am J Surg*. 2009;197:135–136.
13. Eckert M, Cuadrado D, Steele S, et al. The changing face of the general surgeon: national and local trends in resident operative experience. *Am J Surg*. 2010;199:652–656.
14. Sachdeva AK, Bell RH, Britt LD, et al. National efforts to reform residency education in surgery. *Acad Med*. 2007;82:1200–1210.

15. Gladwell M. *Outliers: The Story of Success*. New York, NY: Little, Brown and Company; 2008.
16. Grantcharov TP, Bardram L, Funch-Jensen P, et al. Learning curve and impact of previous operative experience on performance on a virtual simulator to test laparoscopic surgical skills. *Am J Surg*. 2003;185:146–149.
17. Pilot Certification in the United States. Federal Aviation Administration. <http://www.faa.gov/license-certification>. Accessed May 20, 2010, through http://en.wikipedia.org/wiki/Pilot_certification_in_the_United_States.
18. Factual Reports. National Transportation Safety Board. Federal Aviation Administration. <http://www.nts.gov/>. Accessed May 20, 2010.
19. Kolker R. The last aviator. Why they don't make pilots like Sully anymore. *New York Magazine*. Feb. 2009.
20. De Paulo B, Pfeifer R. On the job experience and skill at detecting deception. *J Applied Social Psychology*. 1986;16:249–267.
21. Holzworth R, Pipping C. Drawing a weapon: an analysis of police judgment. *Journal of Police Science and Administration*. 1985;13:185–194.
22. Christensen A, Jacobson N. Who (or what) can do psychotherapy: the status and challenge of non-professional therapies. *Psychological Science*. 1994;5:8–14.
23. Livingston EH, Cao J. Procedure volume as a predictor of surgical outcomes. *JAMA*. 2010;304:95–97.
24. Britt LD. Duty-Hour limitations: a flawed concept. *Am J Surg*. 2010;199:278.
25. Allo M. Presidential Address: widening the circle of compassion. *Am J Surg*. 2009;198:733–735.
26. Santin BJ, Ruscher KA. Do more requirements make better surgeons? *Bulletin of the American College of Surgeons*. 2010; 95:40–44.
27. Chikwe J, De Souza AC, Pepper JR. No time to train the surgeons. *BMJ*. 2004;328:418–419.
28. Purcell Jackson G, Tarpley JL. How long does it take to train a surgeon? *BMJ*. 2009;339:1062–1064.
29. Pugh CM, DaRosa DA, Bell RH. Residents' self-reported learning needs for intraoperative knowledge: are we missing the bar? *Am J Surg*. 2010;199:562–565.
30. Dewey J. *Experience and Education*. West Lafayette, IN: Kappa Delta Pi; 1998.
31. Kelly G. *The Psychology of Personal Constructs*. New York, NY: Norton; 1955.
32. Bell RH, Biester TW, Tabuenca A, et al. Operative experience of residents in US general surgery programs: a gap between expectation and experience. *Ann Surg*. 2009;249(5):719–724.
33. Syed M. *Bounce: Mozart, Federer, Picasso, Beckham, and the Science of Success*. New York, NY: HarperCollins; 2010.
34. Tarpley JL, Tarpley MJ. Presidential address: what business are we in? *Am J Surg*. 2009;198:583–587.
35. McKneally, M. 10,000 hours or ten years to expert performance in surgery. *Surgical Spotlight*. University of Toronto; Summer 2009;17–18. http://www.surgicalspotlight.ca/Article.aspx?ver=Summer_2009&f=EditorColumn.
36. Roberts NK, Williams RG, Kim MJ, et al. The briefing intra-operative teaching, debriefing model for teaching in the operating room. *J Am Coll Surg*. 2009;208:299–303.
37. Aggarwal R, Grantcharov TP, Darzi A. Framework for systematic training and assessment of technical skills. *J Am Coll Surg*. 2007;204:697–705.
38. Bloom M, Rawn Ch, Salzberg AD, et al. Virtual reality applied to procedural testing: the new era. *Ann Surg*. 2003;237: 442–448.
39. Fried GM. Lessons from the surgical experience with simulators: incorporation of training and utilization in determining competency. *Gastrointest Endosc Clin N Am*. 2006;16:425–34.
40. Anderson JM, Aylor ME, Leonard DT. Instructional design dogma: creating planned learning experience in simulation. *J Crit Care*. 2008;23:595–602.
41. Debes AJ, Aggarwal R, Balasundaram I, et al. A tale of two trainers: virtual reality versus a video trainer for acquisition of basic laparoscopic skills. *Am J Surg*. 2010;199:840–855.
42. Thijssen AS, Schijven MP. Contemporary virtual reality laparoscopic simulators: quicksand or solid grounds for assessing surgical trainees? *Am J Surg*. 2010;199:529–541.
43. Anastakis JD, Regehr G, Reznick RK, et al. Assessment of technical skills transfer from the bench training model to the human model. *Am J Surg*. 1999;177:167–170.
44. Vroom VH. *Work and Motivation*. New York, NY: John Wiley and Sons, Inc.; 1964.
45. Robeznieks A. Public favors limiting residents' hours: survey. *Modern Healthcare*. June 1, 2010. <http://www.modernhealthcare.com/article/20100601/NEWS/306019978>.